LIGHTING DATA

EDISON LAMP WORKS
OF GENERAL ELECTRIC COMPANY

GENERAL SALES OFFICE HARRISON, N. J.

The Lighting of Textile Mills

Information compiled by

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Lighting Service Department

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SYNOPSIS:

For information regarding MAZDA lamps and lighting questions, refer to the nearest sales office.

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Introductory

In the latter part of the 19th century electricity was introduced in the mill, both for power and light. Prior to 1890 very little overtime work or work during the dark hours was attempted in the mills, because of inadequate illumination. Early lighting was by means of the tallow candle which was later superseded by the kerosene lamp and the open flame gas burner. About 1890 the carbon incandescent lamp and the carbon arc lamp were introduced.

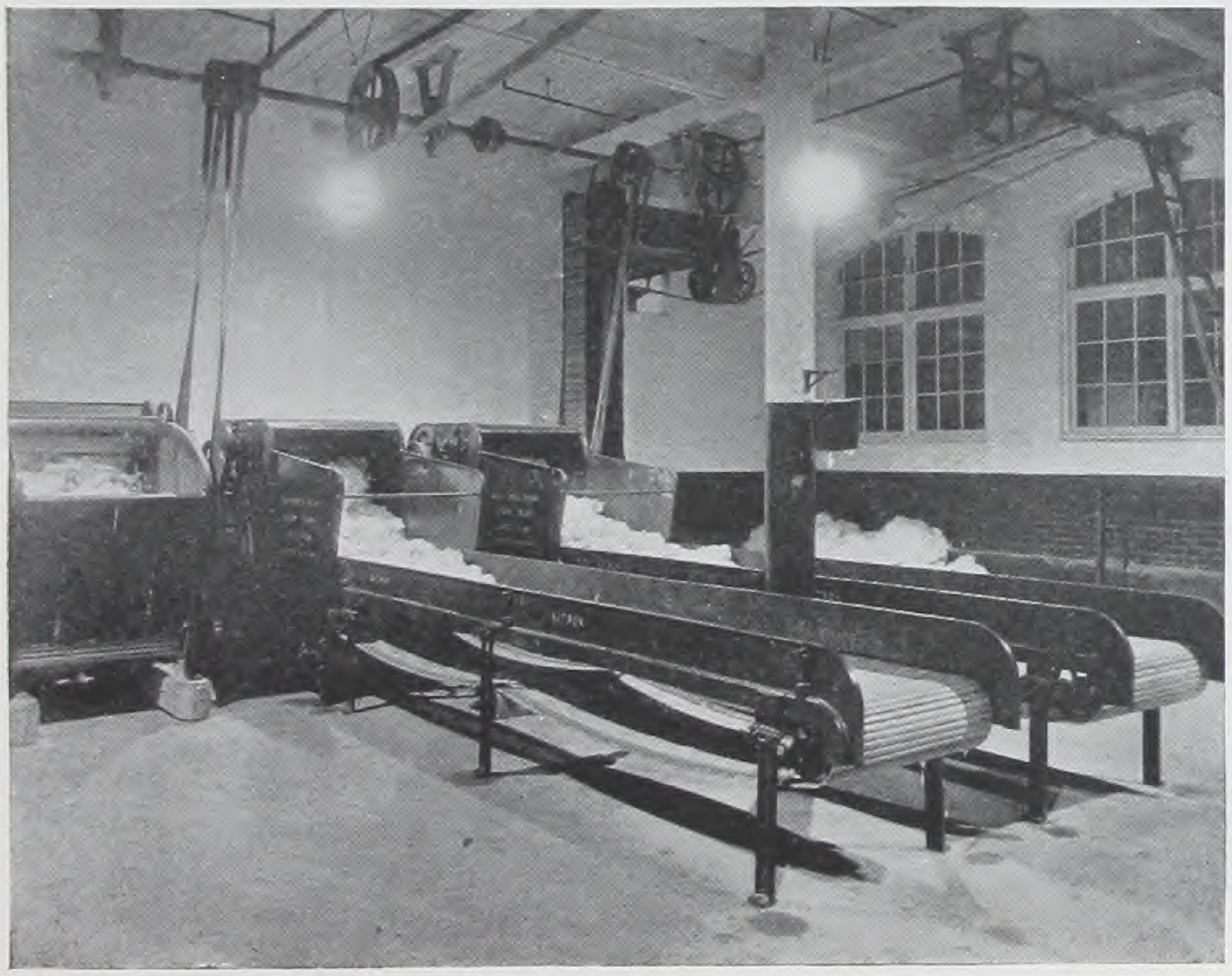

FIG. 1

Night View. Bale breakers in a cotton mill lighted by 100-watt Edison MAZDA lamps in aluminum finish deep bowl steel reflectors hung 15 ft. high, spaced 21 by 14 ft. This arrangement furnishes an even distribution of light of moderate intensity

The improvements in the lighting unit paralleled the improvements made on the machines used in the manufacture of cloth.

With the introduction of efficient lamps and reflecting devices, mill managers began to give considerable attention to the question of artificial lighting. Tremendous strides of advance were made, and in the last ten years lighting has been completely revolutionized.

Much higher standards are the practice, and these have been attended by great economic gains in mill operation. The value of correct illumination has been completely demonstrated and the future looks very bright.

Lighting is destined to assume an even greater importance as the cost of labor and materials increases and competition becomes keener. It may even become a deciding factor between profit and loss. Lighting is not a necessary expense to be minimized, but is a most important aid in the economic production of cloth.

FIG. 2

An Installation of Deep Bowl Porcelain Enameled Steel Reflectors and 100-watt Edison MAZDA Lamps Hung 12 ft. High, Spaced 12 by 22 ft. in the Picker Room of a Cotton Mill. The white side walls and ceilings give excellent diffusion to the light and prevent the room appearing gloomy. This condition sometimes prevails when deep bowl reflectors are used in rooms with dark surroundings

It has been very definitely proven that high intensity lighting gives material increases in production. See Bulletin Index 17. Suitable light is as essential to the safety of employees as any of the guards applied to belts, pulleys, etc., and the mill manager is urged to study Bulletin Index 18, entitled, "Light and Safety."

Methods of Illumination

A few years ago low candle-power, inefficient carbon incandescent lamps and high candle-power arc lamps were the only two electric illuminants suitable for textile mill lighting. At this period there were two extremes of practice: drop lamps hung close to the work or arc lamps hung as high as possible and spaced quite widely. Direct lighting was universally employed. The drop lamps were

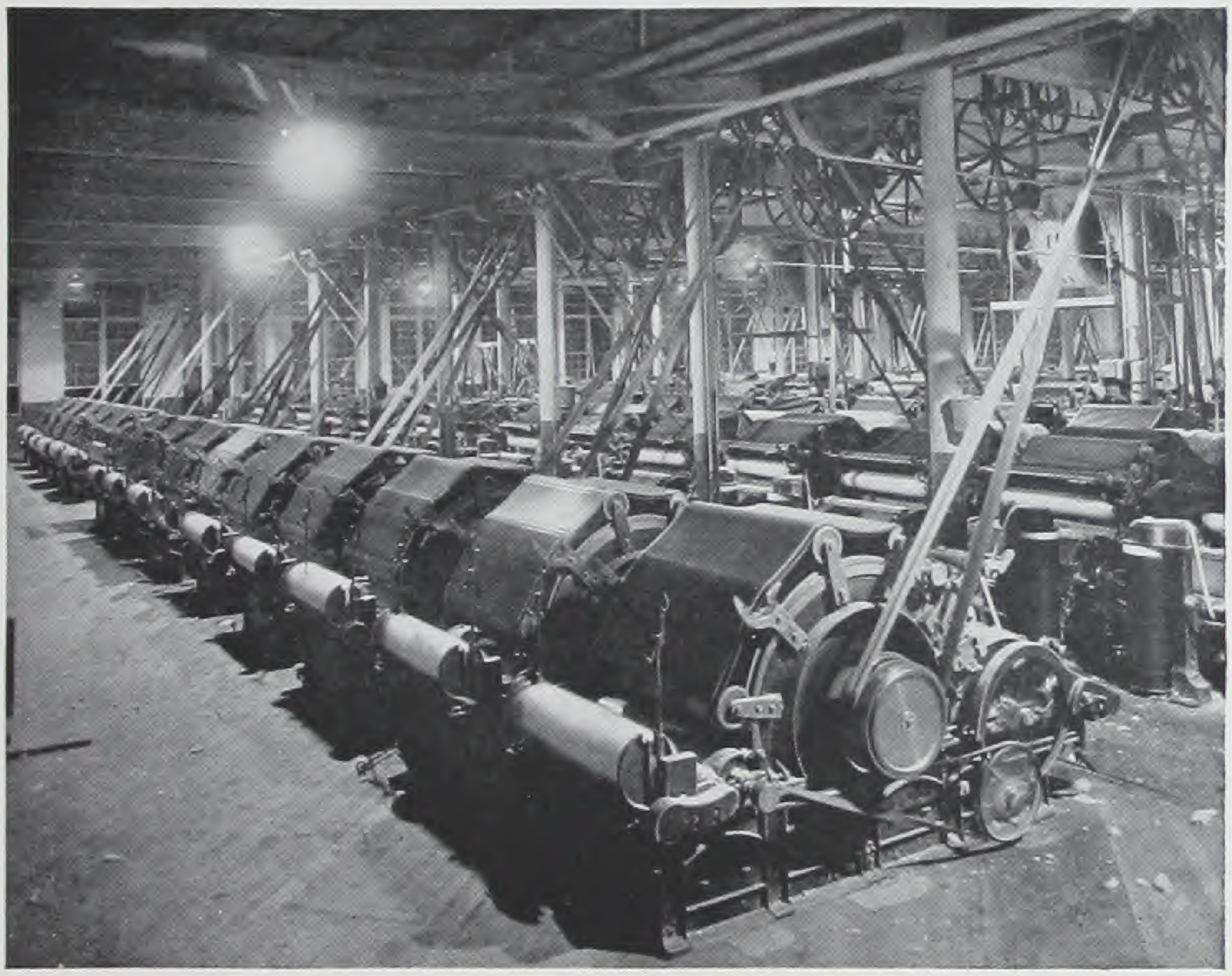

FIG. 3

Night View. Carding department, lighted by 500-watt Edison MAZDA C lamps in deep bowl enameled steel reflectors, hung 16 ft., spaced 32 by 30 ft., staggered

either bare or equipped with painted conical shades which concentrated the light directly beneath the unit. The reflectors on the arc lamps, if any, were generally of necessity relatively ineffective on account of arc travel.

When the efficient MAZDA lamp (see Bulletin Index 1 for more complete data on MAZDA lamps) appeared on the market, it very

soon replaced both the carbon lamps and the arc lamps, and an intermediate practice came into vogue. Medium size MAZDA lamps with suitable steel reflectors were used for what is known as localized general or group lighting; 40-, 60- and occasionally 100-watt lamps were the most widely used. Lamps were hung from 8 to 10 ft. high and located specifically with reference to the machines. Direct lighting was the rule.

A few years ago the Research Laboratory of the General Electric Company discovered the governing principles of the gas-filled lamps, known as MAZDA C, and this made high candle-power lamps of very high efficiency available. In other words, it is now possible to get as high as six times the amount of light for the same power in MAZDA C lamps as against the old carbon lamps.

Paralleling the introduction of the MAZDA C lamps came improved mill conditions with higher ceilings. Overhead obstructions grew less, individual or group machine drive replaced line shafting and made conditions much more favorable to general illumination. The larger size MAZDA C lamps are more efficient than the smaller sizes, offering another reason for their use. The growing recognition of the good qualities of indirect lighting has caused even these systems to be installed in a number of mills.

General illumination is secured by uniformly lighting an area, irrespective of the location of machinery. In this system all parts of the room receive approximately the same amount of light. This system approaches daylight in character and uniformity. General illumination, where feasible, is to be preferred to local lighting. Fewer outlets are required, lessening wiring costs. Renewal costs are lower, as lamps hanging out of reach are not so likely to be broken. Reflecting equipment does not become useless through constant handling. The room is far more businesslike and is more cheerful. With local lighting there are series of very bright spots with intermediate places in comparative darkness. Accident hazard is increased under these conditions, and workmen lose considerable time adjusting lamps to suit their whims.

To obtain effective illumination of any sort, local or general, lamps must be equipped with suitable reflectors to protect the eye from the bright filament and to direct the light on the work. Many types of reflectors having various properties are standard, as outlined in Bulletin Index 22.

There are two principal groups of reflectors, metal and glass. Glass reflectors are opalescent, prismatic, or mirrored. The opalescent and prismatic glass reflectors are not very extensively used in textile mills. Dust and dirt collect on any lighting equipment, and with translucent reflectors is much more noticeable. Such reflectors, however, are often quite desirable on account of the light emitted upward, which makes the room appear more cheerful.

If a good cleaning system is maintained, there should be no reason why such reflectors should not receive much wider use. In

FIG. 4

Drawing Frames in a Cotton Mill as they Appear by Night Under a High Intensity of General Illumination. Deep bowl enameled steel reflectors with 500-watt Edison MAZDA C lamps are hung 16 ft. above the floor on centers spaced 22 by 33 ft.

fact, some mill superintendents prefer translucent glass reflectors for the following reasons: Cleaners in sweeping down are very likely to strike metal reflectors heavy blows and break the lamp. The translucent reflector appears more fragile and the workman is not likely to hit it a heavy blow. Dense, opal, direct lighting reflectors are very efficient and low in first cost. The prismatic

and mirrored glass reflectors although of somewhat higher first cost give high light output.

Whatever system of lighting is used, however, the question of proper maintenance and cleaning is of such importance to obtain satisfactory results that it has seemed advisable to treat this phase of lighting practice in a separate bulletin, Index 14.

Steel reflectors are generally recognized as a standard industrial equipment. They are made in two finishes: white porcelain enamel

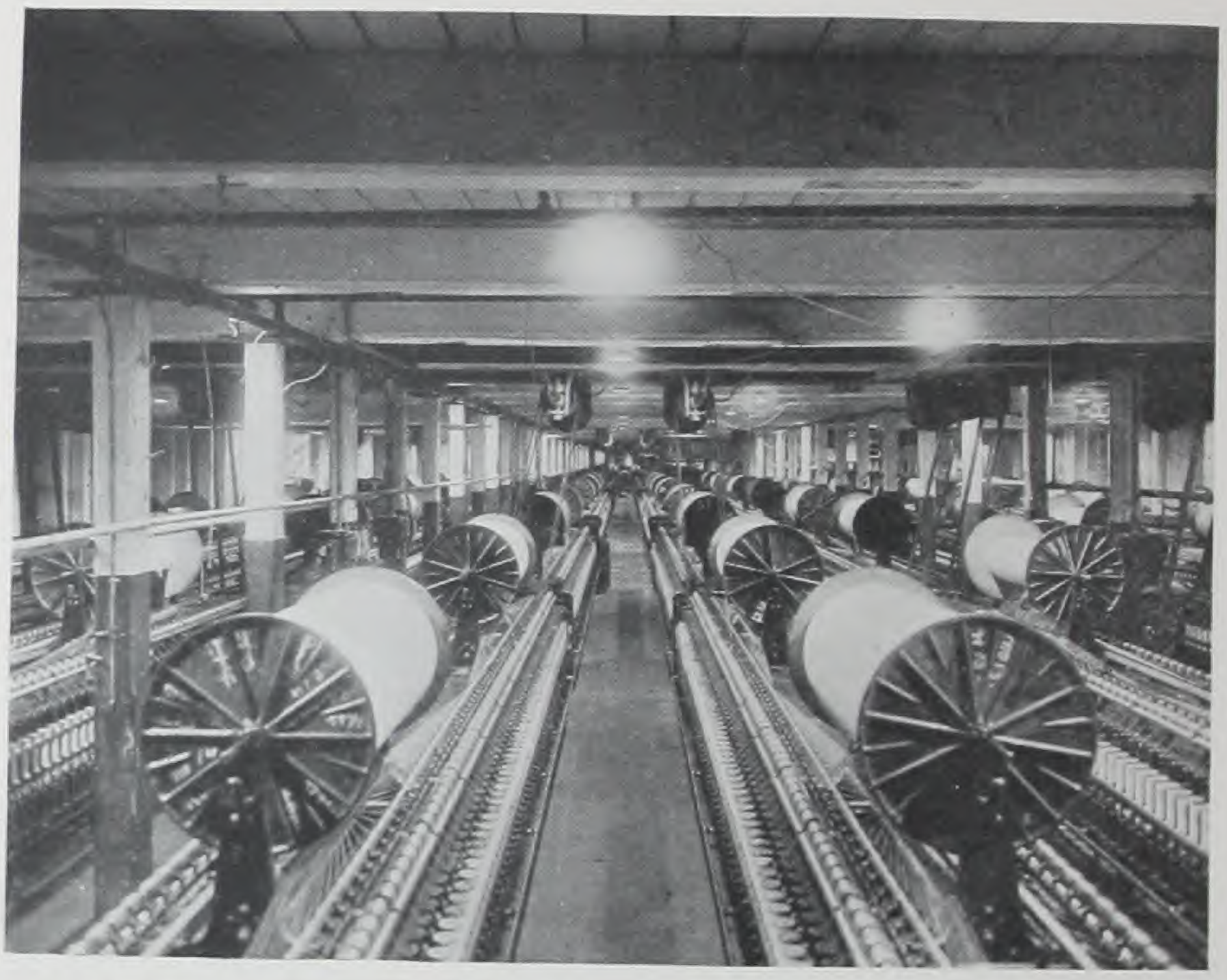

FIG. 5

Night View Down an Aisle of Twisters. Localized general illumination is used on account of the low ceiling. 75-watt Edison MAZDA C lamps in aluminum finish deep bowl steel reflectors are 12 ft. above the floor on centers spaced 8 by 16 ft., staggered every aisle

and mat aluminum. In most industries porcelain enamel is far more widely used and justly so. It presents a surface which is virtually glass. It can be easily cleaned and its luster is not destroyed by scrubbing. It is not affected by moisture or acid fumes. After cleaning it returns to practically initial efficiency. The aluminum finished reflector is widely used in cotton mills. Many

installations are to be seen in which the reflecting surface has practically peeled off or become so dirty that it is useless. The high humidity has a deteriorating effect on the aluminum finish. The greater first cost of porcelain enamel is well justified in view of its durability.

It is very desirable that the ceilings and walls be light in color to reflect such flux as strikes them. Much interesting data on methods of painting will be found in Bulletin Index 15, "Effect of Color of Walls and Ceilings on Resultant Illumination."

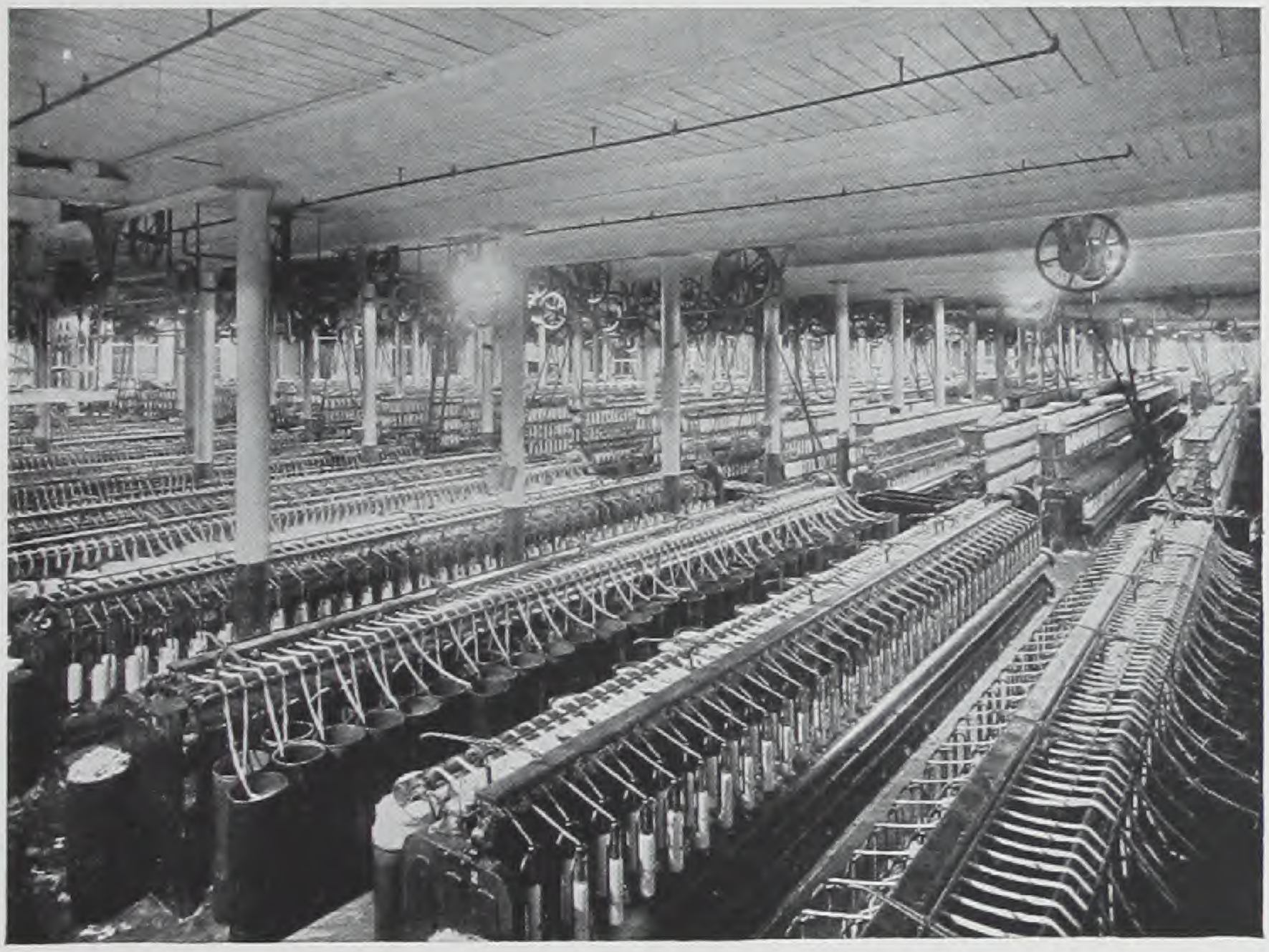

FIG. 6

These Slubbers and Roving Frames Are Very Well Illuminated by a General Lighting System. 500-watt Edison MAZDA C lamps in dome-shaped enameled steel reflectors are placed close to the 18-ft. ceiling on centers 24 by 33 ft. Certainly one could work efficiently in any part of this room

A consideration of the color of light is necessary for those textile processes involving color matching, and an interesting analysis of this question is given in Bulletin Index 3, "Color of Light in Merchandising and the Industries."

Present Practice in Lighting Textile Mills

There are certain general rules which might be laid down on the question of the best methods of lighting any interior. Of course, there will be exceptions to these.

From a standpoint of wiring costs, it is desirable to keep the number of outlets at a minimum. Also considering lamp efficiencies, the larger the lamp the greater the light output per unit of power input. It is obvious that this could be carried to an extreme and make the lighting practically worthless. However, assuming that it is advisable to use large units, let us consider what features limit the size.

1. Ceiling Height

The angle at which the light strikes the work is controlled by the hanging height. In other words, lamps hung 20 ft. above the work on 20-ft. centers give the same results as lamps 10 ft. above the work and on 10-ft. centers. All other items being equal, a 400-watt MAZDA lamp, 20 ft. high, would do the same work as four 100-watt lamps 10 ft. high.

2. Overhead Obstructions

If the counter-shafting, piping, etc., is present in quantities, it is apparent that bad shadows would be cast by large lamps widely spaced, which might be avoided with small lamps placed more closely together.

3. Size of Bays

The mill is usually divided into bays by posts or columns and for the sake of appearance, as well as ease of construction, it is essential to space lamps symmetrically with regard to bays. This has an effect on the size of the lamps.

4. Overhanging Parts of Machines

Even if there are no general overhead obstructions, if the machine projects far over the work and lamps are widely spaced, then certain machines, while they may have even lighting on the tops, may produce dense shadows on the work.

5. Color of Walls, Ceiling and General Surroundings

If these are light, reflecting well, then considerable diffuseness is introduced into the illumination. This eliminates dense shadows and permits wider spacings. In cotton mills working on white goods, the illumination on the under sides of machines and harnesses is aided very materially by the light reflected from the warps. Even

if reflectors are used which send no light to the ceiling, the looms reflect so much light upwards that the ceiling always appears bright.

6. Degree of Accuracy of the Work

Some processes are very exacting, requiring minute inspection. Others demand merely enough light to see all parts of the machine clearly. This, of course, has an effect on the manner in which the illumination is supplied.

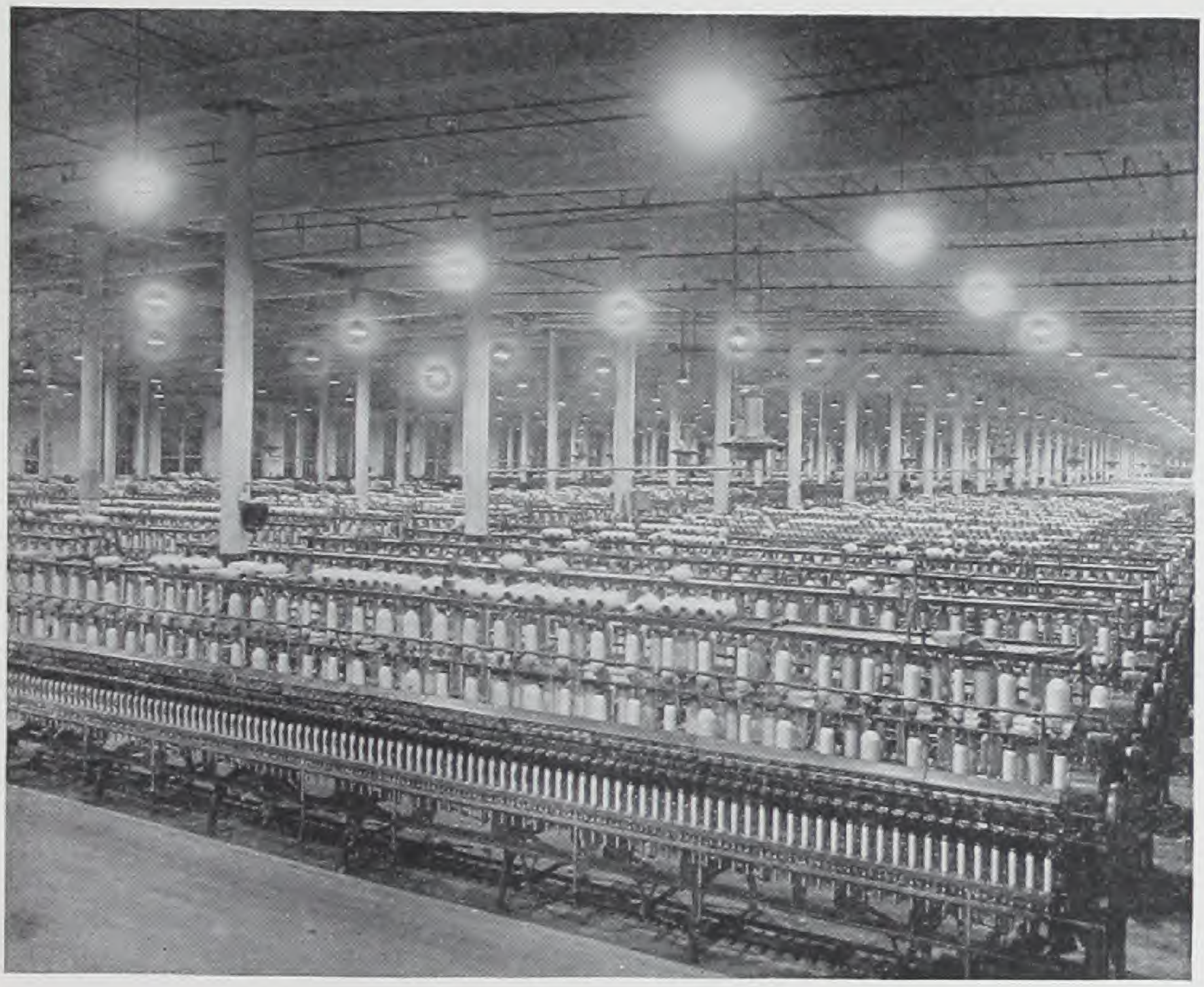

FIG. 7

Night View of a Spinning Room. General illumination is used. 100-watt Edison MAZDA C lamps in aluminum finish bowl reflectors are hung 14 ft. high, spaced 11 by 14 ft. The distribution is such that excellent light is had on vertical surfaces. The whole room is uniformly illuminated, cheerful and safe

In those processes involving single threads (for example, doubling or spinning, etc.) moderate general illumination is sufficient, but where the threads become grouped together as in warping and weaving, special lighting, increasing in intensity as the cloth approaches completion, is required. For such work localized general illumination is needed.

Taking these items into consideration, it is apparent that one cannot lay down specific recommendations which will cover mills of varying constructions. Assuming that there are no structural difficulties to interfere, we may lay down certain rough groupings and analyze the processes in the textile mill as to the group in which they belong.

All figures given below apply to direct lighting alone; where the indirect systems are employed they should be increased by 25 to 50 per cent, depending on local conditions.

FIG. 8

Localized General Illumination Applied to Cotton Warpers. One 75-watt Edison MAZDA C lamp in deep bowl aluminum finish, intensive reflector is placed above each reed and a similar 40-watt extensive unit over each creel

A. Rough Work, Requiring No Discernment of Details (General Illumination of Approximately 1½ Foot-candles)

Ceiling below 12 feet—100-watt MAZDA C lamps on 20-ft. centers.
Ceiling 12 to 16 feet—150-watt MAZDA C lamps on 25-ft. centers.
Ceiling above 16 feet—200-watt MAZDA C lamps on 30-ft. centers.

On these wide spacings, the bowl enameled lamp in the shallow dome porcelain enameled steel reflector is usually best suited.

B. Work Requiring Observation of Machine Operation and the Like (General Illumination of Approximately 4 Foot-candles)

Ceiling below 12 feet—75-watt or 100-watt MAZDA C lamps on 10- or 12-ft. centers, respectively.

Ceiling 12 to 16 feet—150-watt MAZDA C lamps on 15-ft. centers.

Ceiling above 16 feet—200-watt MAZDA C lamps on 18-ft. centers.

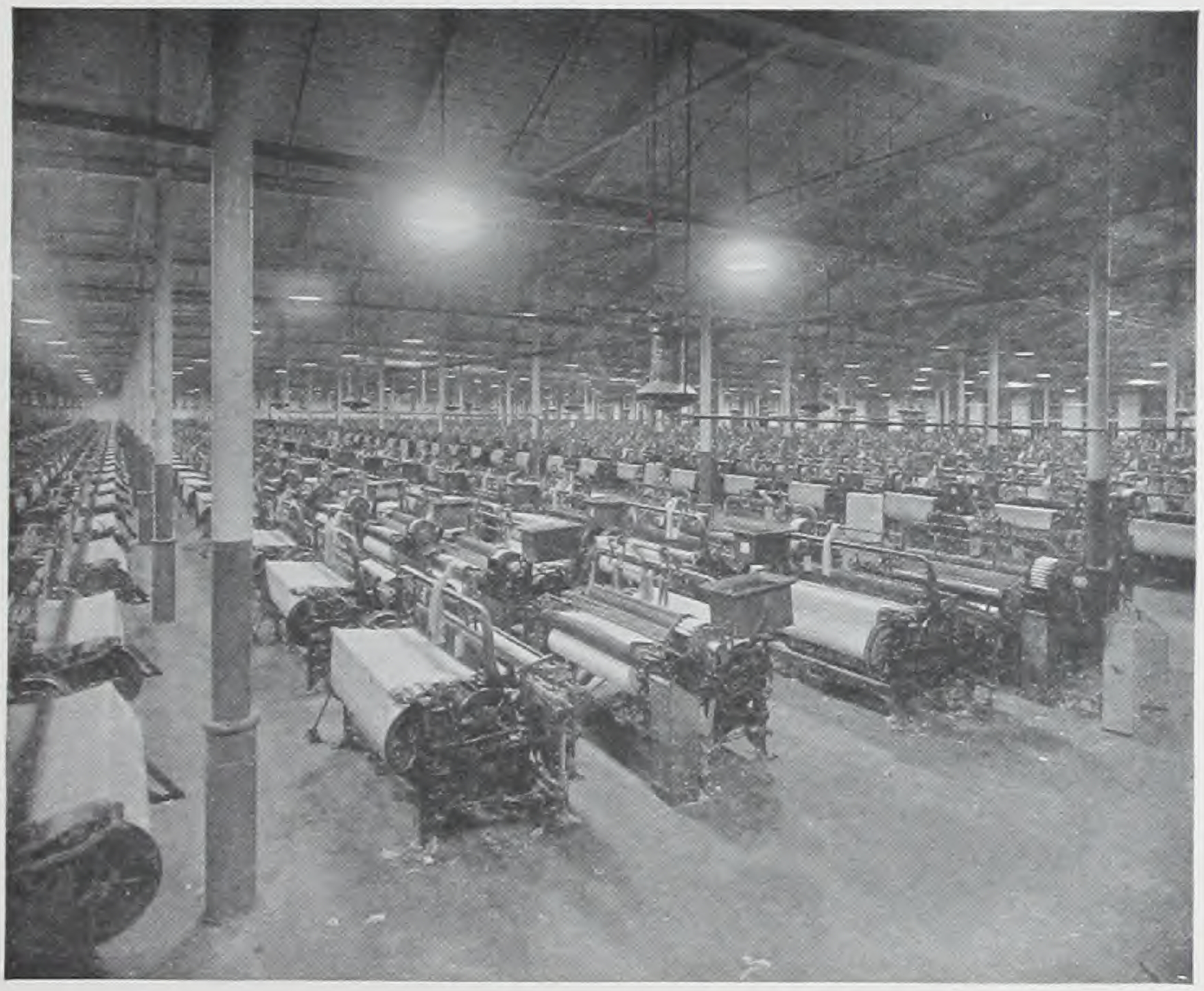

FIG. 9

A Thoroughly Modern Weave Shed as it Appears Under Artificial Illumination. 200-watt Edison MAZDA C lamps in reflecto-cap units are hung 15 ft. high, spaced 21 by 24 ft. This reflecting device is designed to give excellent diffusion and minimize glare. It is of interest to note the absence of overhead obstructions and the general neatness of the entire shed

Most installations should employ bowl enameled lamps in RLM dome or bowl type porcelain enamel steel reflectors, although clear lamps in enclosing globe fixtures and special units, such as the reflecto-cap equipment, find application. Where such devices, with higher absorptions than the open reflectors, are employed, the suggested spacings should be diminished or larger lamps used on these spacings.

C. Work Requiring Discrimination of Detail (General Illumination of Approximately 8 Foot-candles)

Ceiling below 12 feet—100-watt or 150-watt MAZDA C lamps on 9-ft. or 11-ft. centers, respectively.

Ceiling 12 to 16 feet—200-watt MAZDA C lamps on 13-ft. centers.

Ceiling above 16 feet—300-watt or 500-watt MAZDA C lamps on 16-ft. or 20-ft. centers, respectively.

Reflector equipment as outlined above should be used.

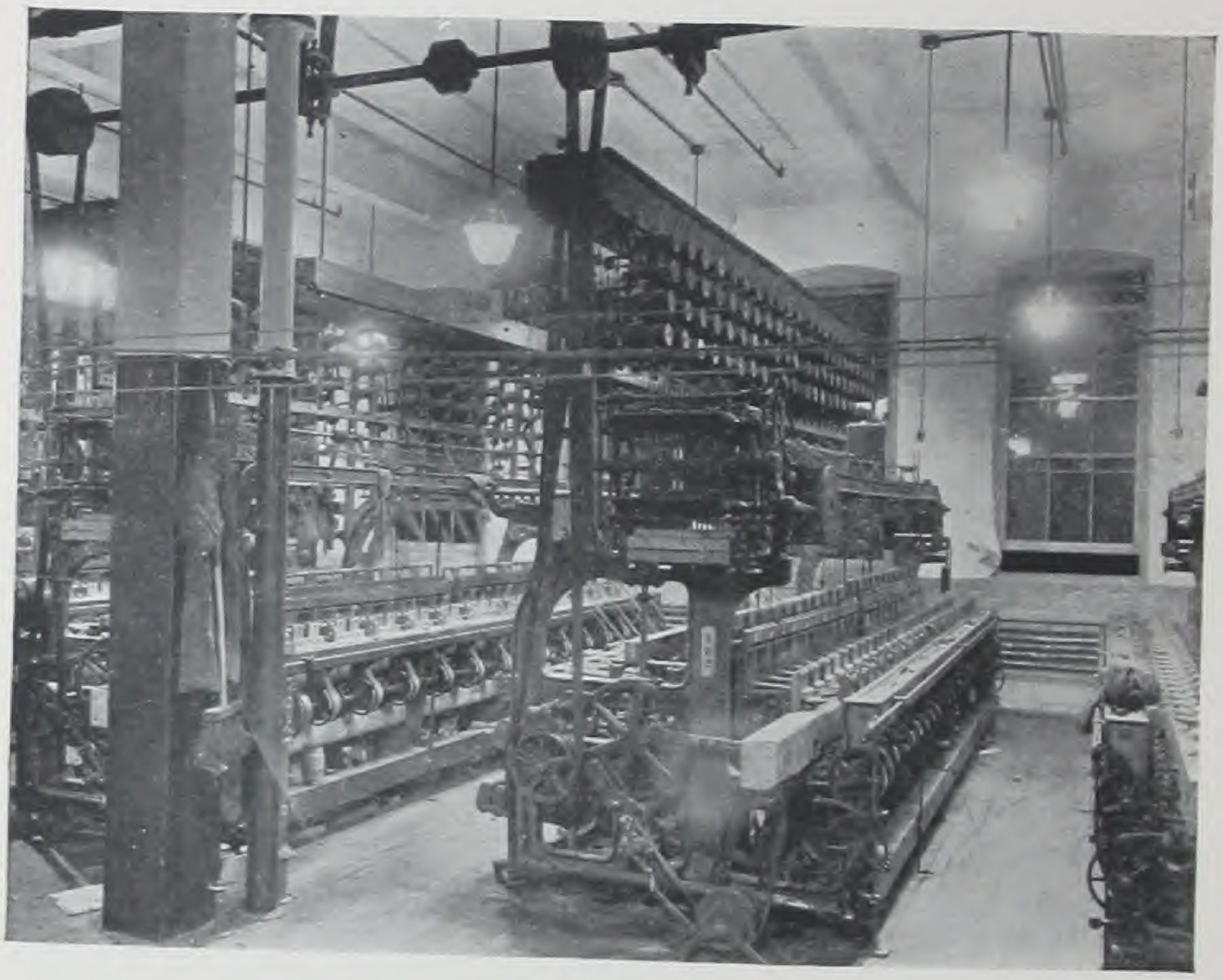

FIG. 10

To Properly Light These Tape Looms with the High Racks which Cast Shadows, is Somewhat of a Problem. 200-watt Edison MAZDA C lamps in semi-indirect fixtures have been used here successfully. The ceiling is light in color, reflecting well. All parts of the machines stand out clearly in this night photograph

Cotton

Openers or Bale Breakers and Pickers

The work done in this department is not in the least exacting. Material is handled in bulk and there is no demand for close vision, although for safe operation, all moving parts must be clearly visible.

The general illumination scheme "*A*" outlined above will be suitable. Figs. 1 and 2 show rooms of this character as they appear by night under such lighting conditions.

Carders and Drawing Frames

The material has not yet been reduced any great amount in size and scheme "*A*" will prove reasonably satisfactory; in fact, such an arrangement is used by a number of mills. Better practice, however, seems to favor a higher intensity of general illumination as produced by arrangement "*B*." The old scheme of having small lamps (40 watts) close to the machine, is rapidly being abandoned. Figs. 3 and 4 show, respectively, cards and drawing frames lighted to an intensity of about 4 foot-candles.

Slubbers, Intermediates, Speeders, Spinning Frames, Twisters and Spoolers

It is true that the thread becomes successively smaller in these processes, yet they present the same lighting requirements, with increasing quantity of light as the thread approaches completion. One feature is quite important, good illumination on vertical surfaces, for the spindles are in this plane. A reflector which concentrates the light is not applicable.

If the ceiling is low and the frames high, it is quite apparent that general illumination is not well suited. Under these conditions outlets should be located over the aisles between machines. It is often advisable to stagger the lamps in alternate aisles; 60-, 75- and 100-watt MAZDA lamps are used for this purpose, on centers from 10 to 18 ft. Fig. 5 shows the localized general lighting scheme applied to twisters in a low ceiling room. If lamps can be located a reasonable distance above the tops of machines (at least 6 ft.) the method "*B*" general illumination will prove well suited. Figs. 6 and 7 show this scheme in use.

Warpers

This is one of the most exacting propositions in the cotton mill, for each thread must be seen distinctly as it passes from the creel through the reed to the beam. It can, however, be well accomplished under general illumination supplied as suggested under "*C*." Some mills still utilize the localized general lighting scheme where one 60- or 75-watt MAZDA lamp in bowl-shaped steel reflector is hung about 9 ft. above the floor over each reed and creel. Fig. 8 is a night view of such lighting.

Slashers

The general lighting according to system "*A*" applies here, or a localized general arrangement of small lamps and suitable reflectors at both ends of the machines is also used.

Drawing-in or Tying-in

The portion of the plant devoted to this operation should be provided with general illumination from lamps arranged according to "*C*" referred to.

FIG. 11

General Illumination of a Cotton Weave Shed. 100-watt Edison MAZDA C lamps in dome-shaped enameled steel reflectors are hung 12 ft. high on centers 12 by 22 ft. This arrangement is much more efficient from every standpoint than the old style drop lamps

Looms

The weave shed is undoubtedly the part of the mill which receives the most attention in regard to the lighting. Here it is necessary to detect at once any flaw or breaking of a thread.

A few years ago it was deemed essential to have a drop or local lamp close to the work over each harness with possibly an additional

unit in the rear alley. Recent experimentation, however, has proven that high intensity general illumination, with all its advantages as outlined in previous sections, is most feasible. MAZDA lamps with dome or bowl steel reflectors, reflecto-cap units, enclosing globe fixtures, semi-indirect and even totally indirect equipments, have all been applied. Typical weave sheds, as they appear by night are shown in Figs. 9, 10 and 11.

Where very low ceilings or where overhead drive and its multiplicity of shafting are found, then it is often necessary to apply the

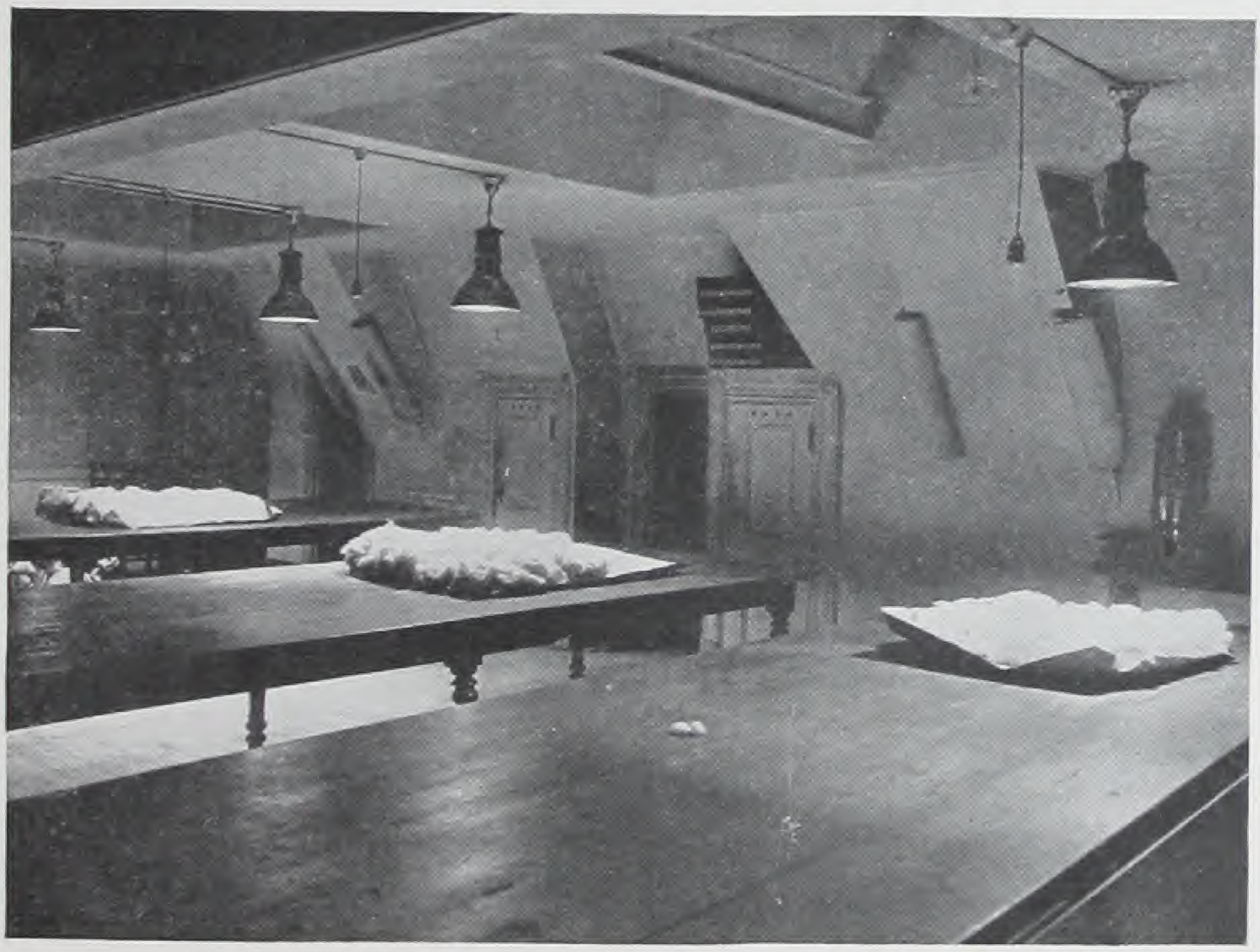

FIG. 12

MAZDA C Color-matching Units as Used for Cotton Classification. Work of this character requires a light which is accurate and constant in color quality

localized general lighting scheme. For white goods on standard looms, the most practical unit for this purpose is a 100-watt bowl-enameled MAZDA C lamp in an RLM dome steel reflector, hung about 9 ft. above the floor to each group of four looms. This places the outlet between every second pair of machines above the weavers' alley.

For wide looms (54- to 72-in. goods) one 75-watt MAZDA lamp in a similar reflector above the weavers' alley between each pair of machines. Where dark goods are being made on either size loom, the next larger lamp should be employed with the arrangement as stated.

The distribution of light from the scheme suggested is such that the rear alley will be well lighted. There will be plenty of "cross light" and the shadows practically eliminated.

Inspecting

This department should be provided with general illumination scheme "*C*" with the lamps properly located in reference to the inspection tables or benches. Where goods of different colors or bleached and unbleached material is handled, the Daylight MAZDA lamp is especially well suited. This form of illuminant helps materially, although not exact enough for the most discriminating color matching.

Packing and Shipping

The methods outlined under "*A*" and "*B*" will prove suitable here, depending on the character of the work, the lower intensity for the rougher work.

Wool

In general, the goods in woolen mills are darker in color than in cotton mills, consequently, it is necessary to provide somewhat higher illumination. The classification given under cotton mill processes, namely, "*A*," "*B*" and "*C*" will be followed. It is advisable, however, to reduce the spacings given in order to provide the higher illumination.

Sorting and Degreasing

General illumination according to scheme "*A*" meets the requirements of these two processes as the work carried on is not exacting.

Washing

This process requires only a low intensity of illumination. With certain arrangement of machines it is possible to employ the general system of illumination, but for most layouts better results may be obtained by locating medium sized MAZDA lamps in RLM dome reflectors at the entrance and delivery ends of the machines.

Carding, Combing and Drawing

The older method of illumination by employing a local lamp for each machine is rapidly being superseded by the general system. Some of the older mills use but a low intensity; the more progressive, however, are following the practice outlined under "*B*."

Roving, Spinning and Twisting

The method of illumination to employ for these processes depends, to a great extent, on the construction of the mill. Since illumination is required on a vertical plane, it is obvious that if

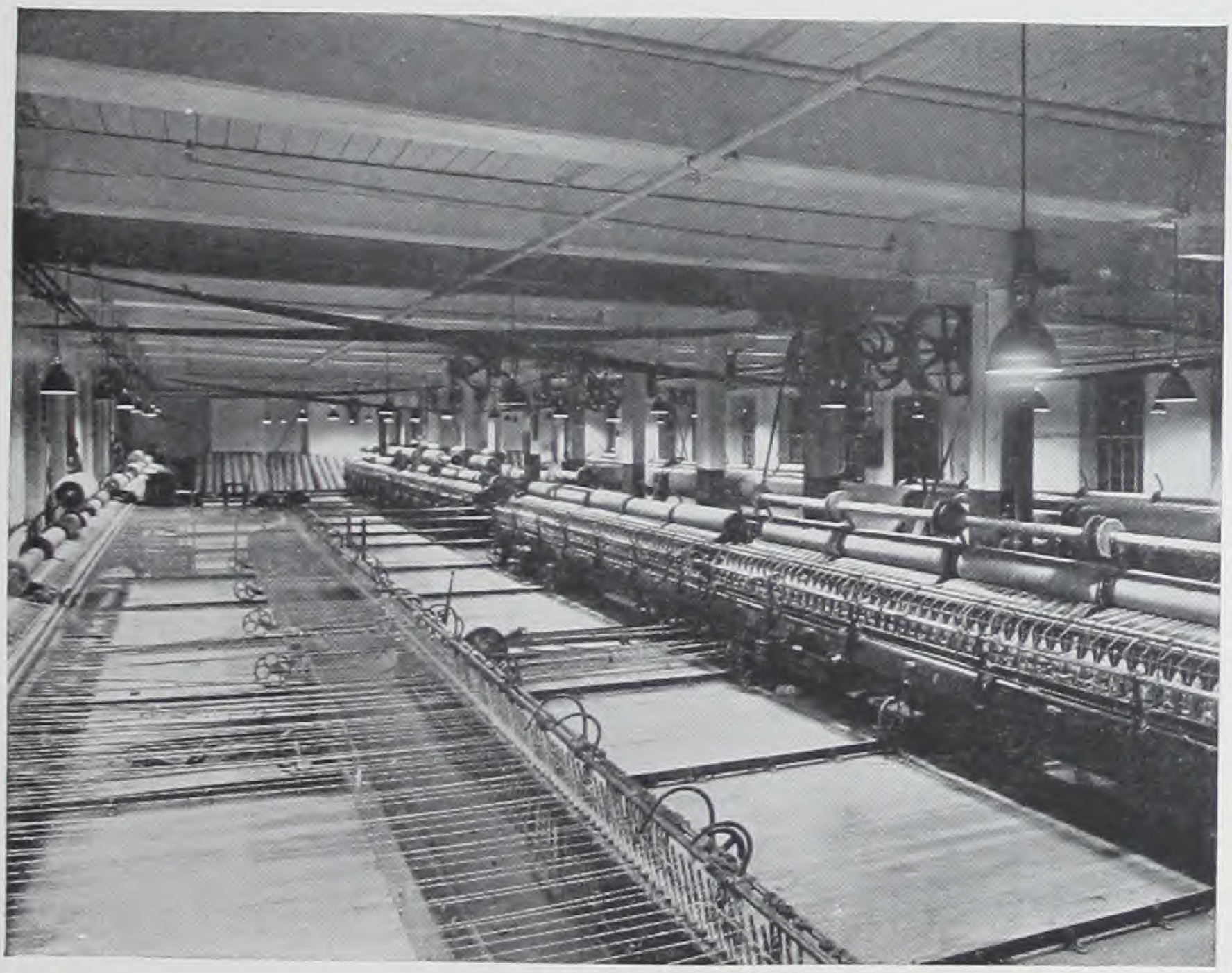

FIG. 13

Night Photograph of the Mule Spinners in a Woolen Mill. 60-watt Edison MAZDA lamps in deep bowl aluminum finish reflectors are located above the head of the frame and over the aisle between the two rows

the ceiling is low and the frames high, that the general system will not be applicable. In this case it is common practice to locate lamps over each aisle between machines. If possible, it is advisable to stagger the units in alternate aisles. From 60- to 100-watt MAZDA lamps are usually employed, depending on the number of lamps used per machine.

Where the ceiling is comparatively high, it is possible to employ the general system of illumination, see "*B*," with complete satisfaction.

For mule spinners, the general system of illumination is also applicable. It is advisable to locate the lighting units in a row over the center of travel of the mules; 60-, 75- or 100-watt MAZDA lamps are hung from 8 to 10 ft. high, spaced on 10- to 12-ft. centers, and equipped with bowl or dome-shaped steel reflectors. This arrangement, using 60-watt MAZDA lamps and bowl steel reflectors, is shown in Fig. 13.

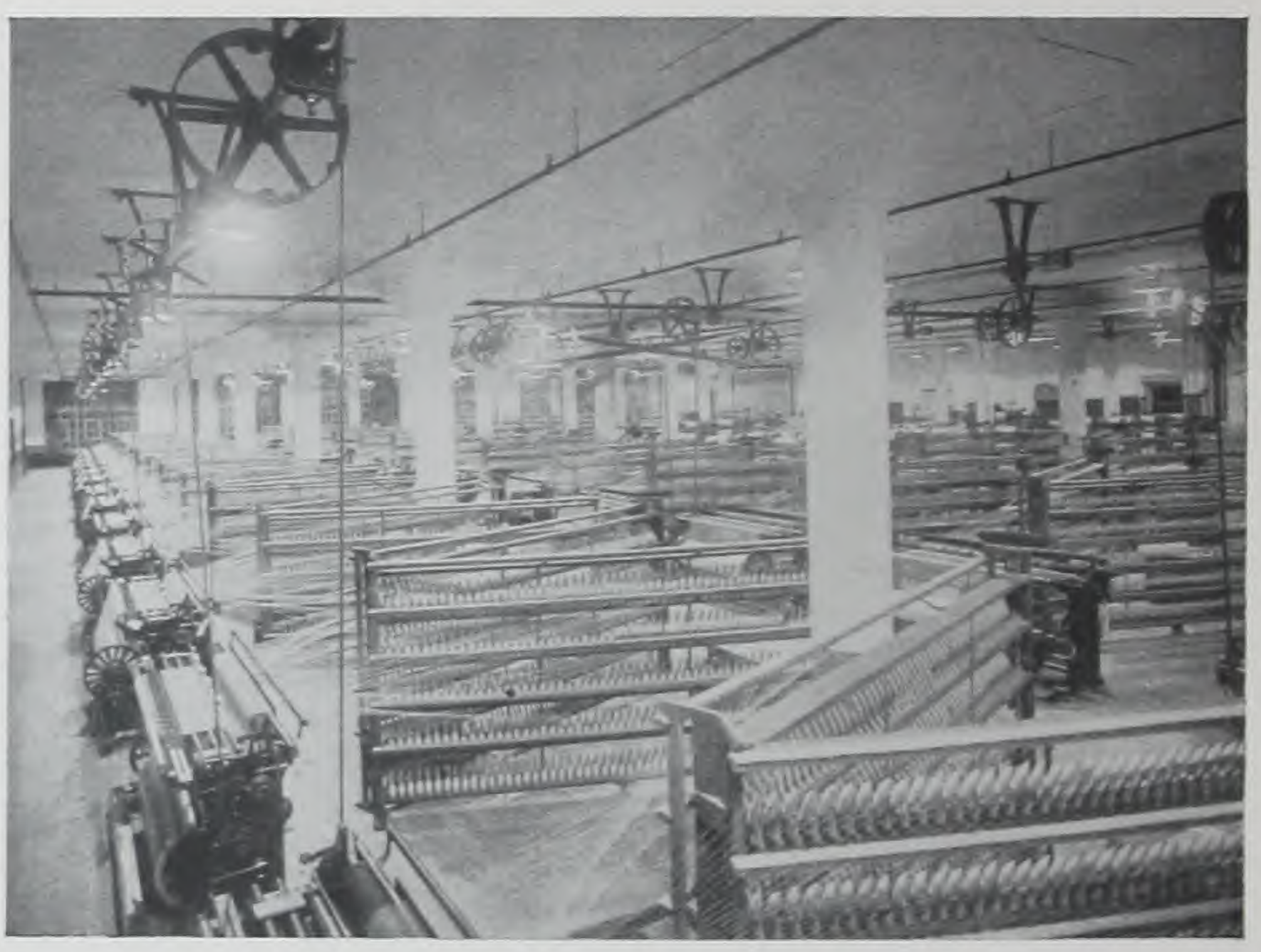

FIG. 14

Wool Warpers Lighted by the High Intensity General Illumination Scheme. One 400-watt Edison MAZDA C lamp in dome-shaped enameled steel reflector is located in the center of each 22-ft. bay close to the 19-ft. ceiling. The room is very neat and cheerful

Warping

This process requires good illumination at both the reed and creel. Although many mills employ local lamps over the creel and reed, consisting of 75- or 100-watt MAZDA C lamps in bowl steel reflectors, experience has shown that the conditions may be adequately met by the system of general illumination of guide "*C*." An excellent illustration of this is shown in Fig. 14.

Tying-in

High intensity general illumination meets the requirements of this portion of the mill.

Weaving

The weave room requires excellent illumination for it is necessary to detect at once any flaws or broken threads. Although it is quite common practice to employ a local lamp over the lay of each loom and one over each rear alley, experimentation has shown that

FIG. 15

A Combination of General and Local Lighting is Used for These Woolen Looms. One 100-watt Edison MAZDA C lamp in mirrored glass bowl-shaped reflector, 13 ft. above the floor is located in the center of each 20-ft. bay. Two 40-watt MAZDA lamps in enameled steel bowl reflectors are used over the front of each loom and a similar unit is placed over the aisle between the backs of adjacent looms

the general illumination scheme "*C*" is far more preferable. Direct lighting with bowl or dome steel, semi-indirect and totally indirect have all been used to complete satisfaction.

Where the weave shed has a low ceiling and there is considerable shafting and belting, it is always advisable to go to the localized general system of illumination, using a 100- or 150-watt MAZDA C

lamp for each group of four machines. With wide machines (54 to 72 in.) a 75- or 100-watt MAZDA C unit should be located above the weaver's alley at each end of a pair of looms. Some mills still employ the combination of general and local lighting, as shown in Fig. 15.

Silk

Throwing Frames

Though the operations themselves are automatic or nearly so, it is necessary that the operator can readily discern spent spools, broken threads, and the like from any position in the aisle.

Formerly, under the localized lighting schemes, the operator was compelled to move the lamp and reflector back and forth to the source of trouble. Ofttimes the part of the frame between units was neglected because the operator could not discern trouble in these areas of little or no light. With the appreciation of this fact and also of the excessive lamp breakage, the lamps were gradually raised higher and higher in order that the cones of light from adjacent lamps might overlap and cause the dark spots to disappear. It was further found that reflecting equipment maintained its effectiveness longer because of less handling. In view of the above, general illumination, see "*B*," using RLM dome reflectors, is coming into use, as shown in Fig. 16.

It is necessary sometimes in preparatory processes where dark soft silk is used continually, to increase slightly the size or number of lamps.

Winding and Quilling

The physical characteristics of these processes are practically the same as for the throwing operations. As a rule these processes, being slightly less automatic in operation, depend a little more strongly on the personal element.

Where universal machines are used and quilling is performed directly from the skeins or where the revolving swifts of the winders are located at the top of the frame, it has been found advisable to use arrangement "*C*" rather than the arrangement "*B*."

Swiss Warpers

Compared with the horizontal type machine, the Swiss warper is very much more compact. The reel or beam is seldom over three yards in circumference and hence not high enough to cast objectionable shadows, the reed is somewhat wider, permitting a greater distribution of threads and the creel usually smaller and more

compact. All these factors combine to make well diffused general illumination of a high intensity practicable. This system of lighting is pictured in Fig. 17.

If the room is so finished and the surroundings will permit, the indirect or semi-indirect systems could be very well adapted to warping on account of their excellent diffusion and absence of annoying shadows.

Horizontal Warpers

Since the reel of the horizontal warper is sometimes eight yards in circumference, it is necessary that outlets should be carefully

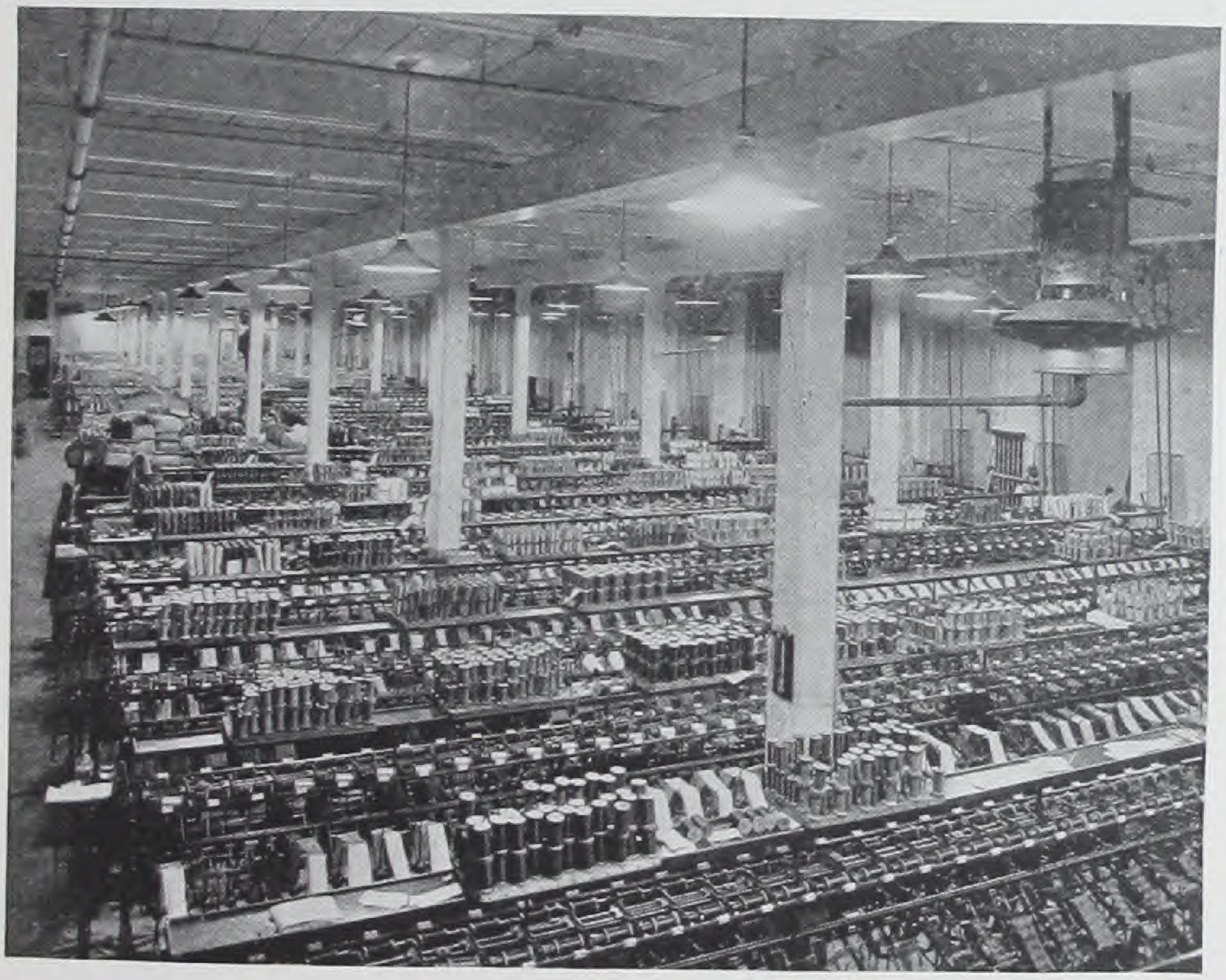

FIG. 16

Winding Can be Accomplished with Maximum Efficiency if Such Lighting as This is Supplied. 100-watt bowl-frosted Edison MAZDA C lamps in enameled dome reflectors are hung 10 ft. above the floor on 12-ft. centers, 6 ft. between rows, staggered

placed. When full, the reel presents a wall, shutting off the light from those areas back of the warper.

Where individual warpers are to be lighted a 75- or 100-watt, bowl enameled MAZDA C lamp, dependent on the nature of the warp, should be provided, equipped with a dome type reflector.

This should be hung about 9 ft. from the floor and placed over the beam. The position of the lamp should be such that the operator, when "beaming off," will not cast a shadow on his work, and the height should be regulated so that reflections from the reels when revolving are not annoying to operators.

Warpers are usually arranged in rows with the beam ends facing each other and forming an alley between, in which the operators work. In this case the same type of unit should be placed between

FIG. 17

The Use of 100- and 200-watt Edison MAZDA C Lamps with Opalescent Enclosing Globes and External Reflector is Shown in This Night Photograph of Swiss Warpers. Outlets are 10 by 12 ft. and lamps 9 ft. above the floor

pairs of machines and centered in the rear alley. This arrangement provides light on each beam from both sides and avoids the likelihood of shadows.

A 60- or 75-watt MAZDA lamp equipped with a bowl reflector should be hung from 2 to 5 ft. above the reed.

At the creel, the requirements are not nearly so rigid, and hence, can be given somewhat less intensity. A 40- or 60-watt MAZDA lamp with bowl or dome reflector is adequate.

For isolated or individual machines, the lamp should be centered over the creel and from 18 in. to 2 ft. in front. This unit should be placed so that objectionable shadows of the operator are not in evidence. In the ordinary arrangement of warpers, the lamp should be hung between creels so that each creel receives light from the two sides.

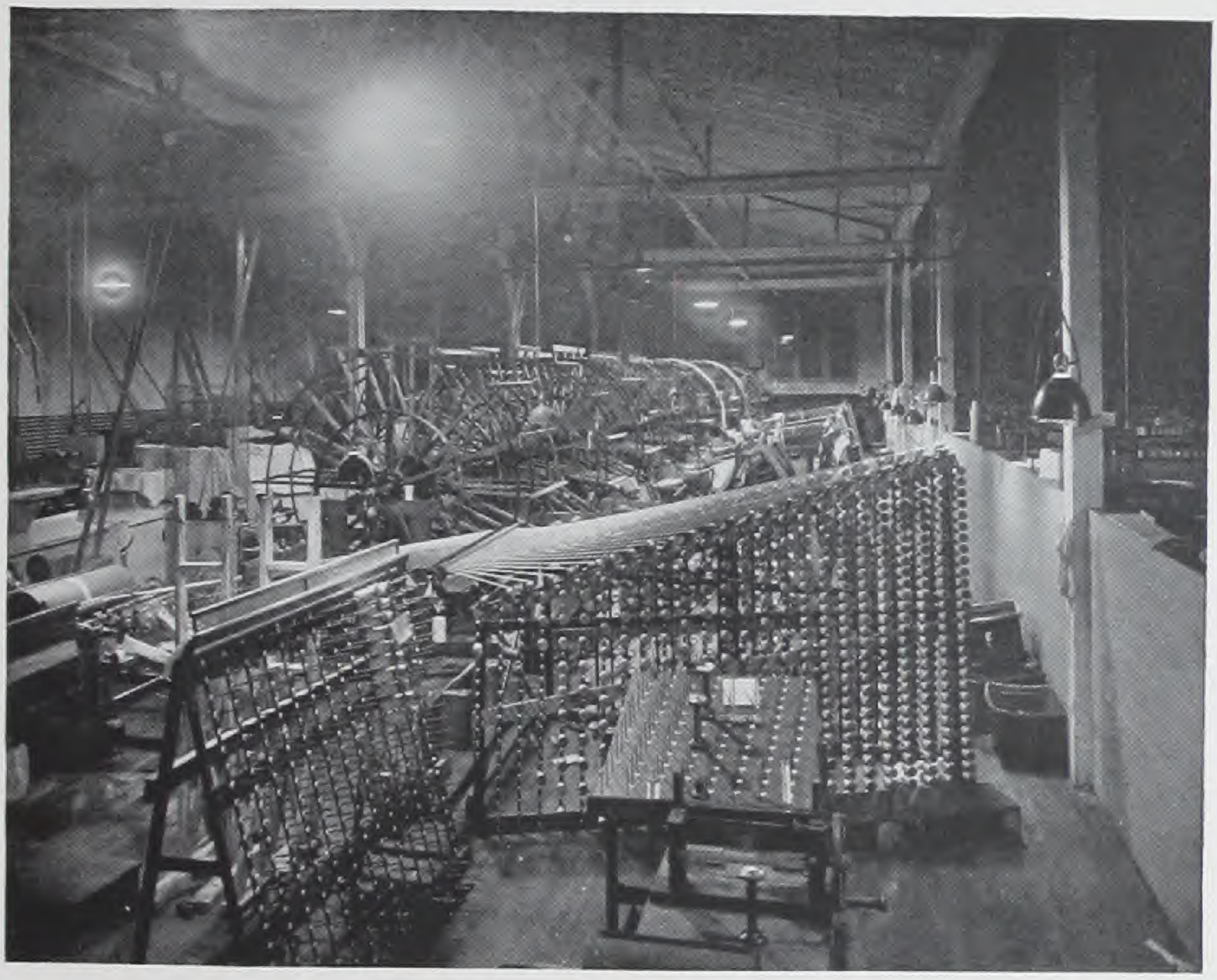

FIG. 18

A Combination of Localized General and General Illumination is Used for These Horizontal Warpers. Medium candle-power Edison MAZDA lamps in deep bowl steel reflectors are hung over the creel, reed and beam. Larger lamps in dome-shaped reflectors provide general lighting and make the room cheerful

Weaving

Weaving is the most important operation in the mill and the lighting of the loom must receive the most careful attention. In this operation, more than in any other, the personal element plays a large part. Mistakes in weaving are disastrous and costly, more so because in this process there is involved the work of all other processes.

For plain or box looms, where the number of shafts are not greater than five, it has been found that 100- or 150-watt, bowl enameled MAZDA C lamps and dome reflectors placed between rows of looms, one such unit to every four machines (localized general lighting) will permit the efficient operation of the loom. It is also well to place at intervals of every four machines a lamp of the same size as the others along the aisles at the side of the room. This permits repairs to be made and counteracts shadows.

Where the number of shafts are considerably greater or where Jacquard looms are used, it becomes very difficult to supply sufficient light by any other than a localized system.

With general or localized general illumination, it would be extremely hard to thread the eye of the heddle in looms of this kind, on account of shadows from overhanging parts. Under these conditions local lighting should be installed. The 40- and 60-watt sizes of MAZDA lamps are preferable, equipped with bowl reflectors of the proper size. These lamps should be hung over the harness or between the harness and the reed and the cord long enough to permit the placing of the lamps to the best advantage when trouble occurs. Such an arrangement appears in Fig. 19.

Regardless of the local loom lighting, a general illumination system of medium intensity should also be provided. The aisles and passageways should be well lighted as well as the aisle between machines. This will relieve the operators from eye strain. The constant change of the eye when looking from comparative darkness onto the lay of the loom cannot be avoided unless ample provision is made for a general lighting system.

Conclusion

All the methods suggested have been tried out and found satisfactory under actual operating conditions. The schemes outlined are not in any sense theoretical. If they are applied with discretion there need be no hesitancy that the lighting will prove suitable for the work in hand.

General illumination largely prevents trouble from shadows. Under ordinary conditions, there will be sufficient diffusion so that even in the shadow produced by an operative leaning over the work there will still be plenty of light to clearly see all threads.

In designing the lighting system for a textile mill, the following general rules must be kept in mind:

1. There must be sufficient light of the proper quality on the work.

2. Glare due to brilliant light sources or reflected from polished surfaces must be avoided in order that operators may see to perform their work without undue eyestrain.

3. Diffusion and proper direction of light are necessary to eliminate sharp shadows. Moderate light on side walls not only helps in this connection, but also makes the room more cheerful. Too much light on the walls is tiring.

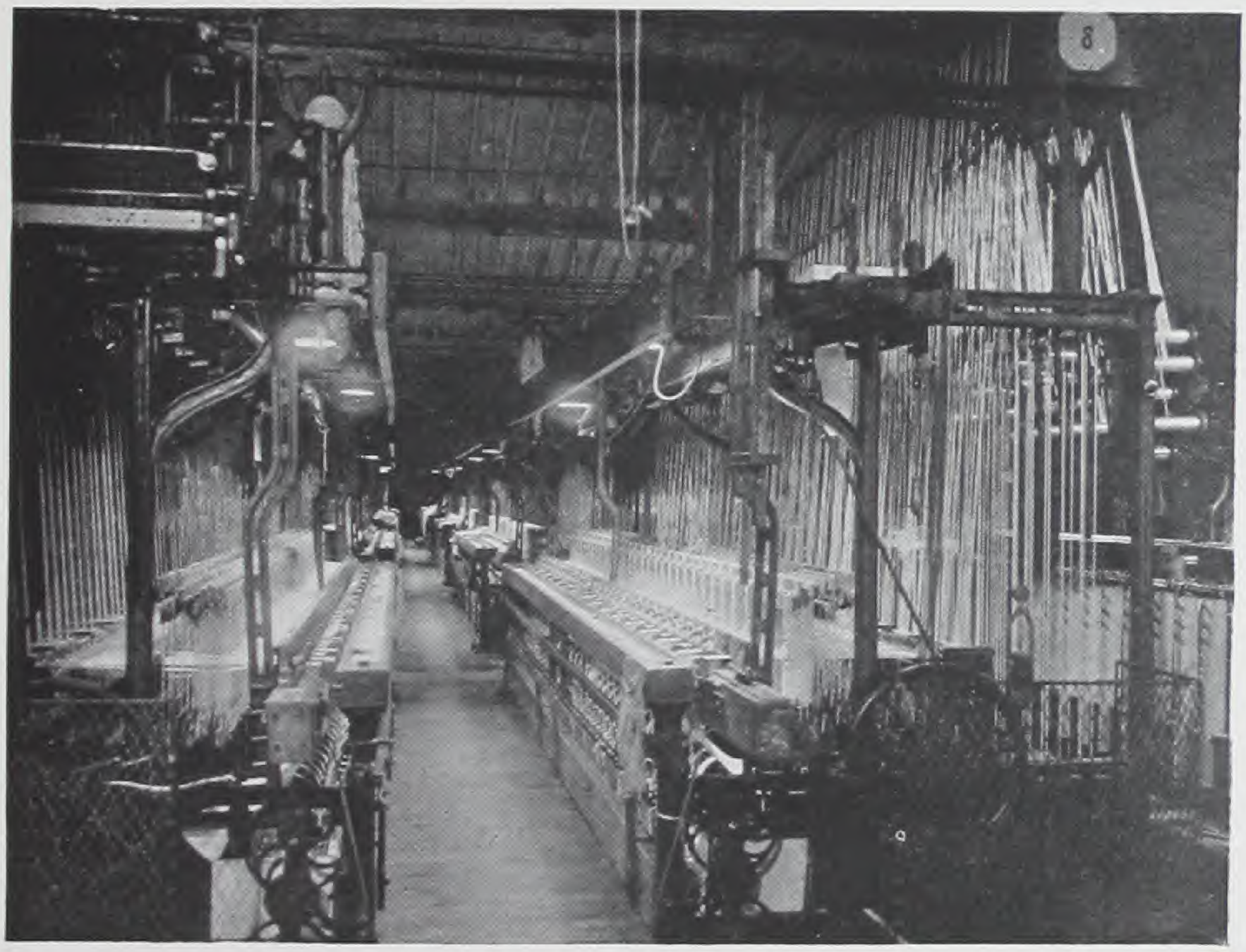

FIG. 19

Local Lighting of Silk Ribbon Looms. Two 60-watt Edison MAZDA lamps in deep bowl steel reflectors are hung over each machine. If the ceiling is unsuited to an indirect system, then such a scheme as this is essential for there are many overhanging parts to cast shadows

4. Besides the light on the work, a moderate intensity should be provided on intermediate sections, so as to eliminate dark spaces.

5. Any system installed in the mill should be simple in arrangement, reliable in operation, and as low in operating cost as is possible.

In no case, however, should good lighting be sacrificed for such a saving, because in the long run this would be found to be poor economy.

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The Foot-candle Meter

You should know the lighting requirements of your mill; equip it to meet these and then maintain the lighting devices as carefully as you do your machines. This makes necessary an instrument with which you may readily measure your illumination and know whether it is of sufficient intensity and proper distribution for the most economic production.

The Foot-candle Meter is such an instrument. It is a small self-contained meter, selling for $25. It is easy to read and of sufficient accuracy to be of real practical value. Without such an instrument you cannot know whether you are maintaining the higher productive intensity or whether you are even conforming to the legislative industrial lighting codes. It is money in your pocket to know and maintain recognized standards of illumination and the Foot-candle Meter will help you.

If operators complain of inadequate illumination, this instrument will permit you to check the "light on the work." In connection with trial or experimental installations or in planning the layout for new buildings or changed arrangements of machinery, it is invaluable.

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